

International Workshop on Flash Floods in Urban Areas and Risk Management

Muscat – Sultanate of Oman

INTRODUCTION

The critical importance of water resources management particularly urban water management in arid and semi-arid regions of South West Asia, CIS and Middle East Countries has drawn the Iranian IHP National Committee to propose the establishment of the Regional Centre on Urban Water Management, with the support of the Government of Islamic Republic of Iran (Ministry of Energy), to UNESCO in the year 2000.

The ceremony for signing the agreement for establishing the Centre was held after the 31st session of UNESCO General Conference, with the presence of the Director General of UNESCO and the Minister of Energy, I.R. Iran in Tehran, February 2002. At present, 11 countries and 5 International Organizations are actively involved in the Governing Board of the Centre at the highest level.

During the four year period since its establishment, the Regional Centre on Urban Water Management with the financial and technical support of I.R. Iran and some other member countries as well as UNESCO, has been able to organize and implement 30 various programs / projects in the framework of UNESCO IHP-VI, which particularly focus on capacity building and training.

This Centre which benefits from Universities and Research Centres in Iran will try to play an effective role in implementing the objectives of IHP-VII within the region.

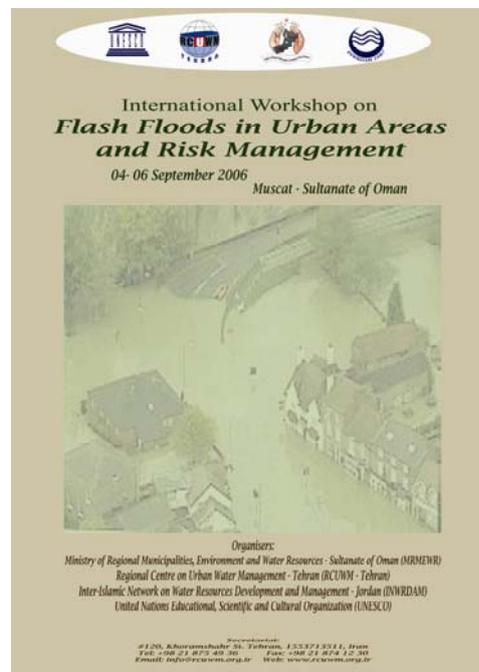
RCUWM – Tehran has so far held 2 Training Courses, 13 Workshops, 1 Seminar and 1 Conference. It is worth mentioning that around 1900 persons / day (experts, university professors and decision makers) have participated in the Centre's technical and Training events.

One of activities which were approved to be held by RCUWM – Tehran and the Ministry of Regional Municipalities, Environment and Water Resources (MRMEWR), Sultanate of Oman, is the International Workshop on Flash Floods in Urban Areas and Risk Management, held in Muscat – Oman, 4 – 6 September 2006.

GENERAL REPORT

Floods are a natural part of the Hydrological cycle. It is reported that flood disasters account for about a third of all natural disasters by number and economic losses. In addition, they are responsible for over half of the deaths associated with all such disasters.

What is more, there is the trend of an increasing number of deaths being due to floods. Increasing urbanization and land development in flood-prone parts has significantly raised the risk of flash floods during last decades. This information is reflected in the attention given to floods by engineers, environmentalists, decision makers and international media. Therefore, flood management is becoming more and more important to the society and flash flood management is seen as an integral part of flood management.



In this respect, the Regional Centre on Urban Water Management – Tehran, under the auspices of UNESCO, in close cooperation with Ministry of Regional Municipalities, Environment and Water Resources, Sultanate of Oman and Inter-Islamic Network for Water Resources Development and Management has held a 3-day workshop, highlighting the importance of flash flood management in the context of integrated water resources management and mitigation measures can be taken for planning, design and forecasting flash floods, especially in urban areas. This workshop was held in Muscat – Sultanate of Oman, 4 – 6 September 2006.

This workshop was an opportunity to bring together scientists, experts, managers and decision makers as well as governmental and non-governmental organizations in order to discuss, deliberate and represent their valuable practices and experiences in different aspects of flash flood management in urban areas with emphasize in arid and semi-arid regions.

The workshop topics were:

- Flood Management and information technology
- Floods in Wadi and arid and semi-arid areas
- Flash flood modeling methods and techniques
- Urban flooding and risk management
- Socio-economic and human health impacts of flash floods
- Flash flood forecasting techniques
- Flood management and mitigation options
- Case studies

There were around 20 lecturers who presented their fruitful papers from different countries of the world including: Germany, Jordan, UAE, Iran, Bangladesh, Turkey, Pakistan, Syria, Oman, Finland, Canada, Kuwait, India and Yemen.

The opening session was attended by H.E. Abdulaziz bin Mohammed Al-Rawas as the Senior Advisor of H.E. Sultan Qaboos in Cultural Affairs, H.E. Mr. Al-Rawas as the Minister of Regional Municipalities, Environment and Water Resources – Sultanate of Oman and H.E. Mr. Fattah as the Minister of Energy – I.R. Iran and the Chairman of RCUWM – Tehran Governing Board.



The opening session was addressed by:

- 1- The Executive Director of Inter-Islamic Network for Water Resources Development and Management (INWRDAM), briefing the participants on the background of cooperation with the Omani and Iranian partners on holding this international event. He also explained about the activities carried out by INWRDAM during the recent years and he finally appreciated all the organizers for holding this event.



- 2- Dr. Reza Ardakanian, as the Director of the Regional Centre on Urban Water Management (RCUWM – Tehran) addressed the participants by welcoming them all. He briefed the participants on figures and statistics related to different water disasters in general and flash floods in particular. He stated that this workshop will absolutely bring new approaches toward flash flood mitigation strategies. A brief report on RCUWM's activities and performance during its establishment as well as its long-term plans were described by Dr. Ardakanian. He finally thanked Dr. Al-Bakri as the Undersecretary for Water Affairs in the Ministry of Regional



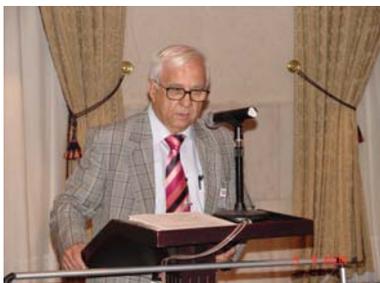
Municipalities, Environment and Water Resources – Sultanate of Oman and his wonderful team for their effective efforts in organizing this great event.

- 3- H.E. Mr. Al-Bakri addressed the participants on the Number of papers to be presented, the representatives of different governmental and non-governmental organizations attending this workshop and he finally stated that the MRMEWR is quite prepared to jointly implement the strategies approved during the 3-day workshop for the benefit of all regional countries.



After the opening session, the first technical session started under the main theme "Flood Management and Information Technology". The following papers were presented by the lecturers during this session.

- 1- Determination of Flood Inundated Areas Using RS Techniques and Application of Regional Flood Frequency Analysis for the Western Black Sea Region of Turkey, by Mr. Unal Sorman, Prof. Middle East University – Turkey
- 2- Possibility of Developing a Local Flood Warning System in Oman, by Mr. Soleiman Said Al-Obaidani, MRMEWR, Sultanate of Oman
- 3- Wadi Gauging Network in the Sultanate of Oman, by Mr. Ahmed Said Al-Barwani, MRMEWR, Sultanate of Oman
- 4- Observation Methods and Requirements in Flash Flood Forecasting, by Mr. Kommo Ristolainen, Expert of Vaisala Oyj – Finland
- 5- Advances in Flash Flood Forecasting and Mitigation, by Mr. Hans Christian Ammentrop Senior Expert from DHI Water Environment – Denmark



The second technical session on Flood Estimation and Modeling started at 12:30 by having the following papers presented:

- 1- Flood Estimation, Flood Frequency with Direct Analytic Statistical Method by Mr. Akbar Shokrollahi, Senior Expert, Dezab Consulting Engineers, Iran
- 2- URBAS: Prediction and Management of Flash Floods in Urban Areas by Mr. Dietmar Castro. Prof. University of Applied Sciences Aschen, Germany

- 3- Flash Flood Monitoring by Mr. Yahya Zidjali, Sultan Qaboos University, Sultanate of Oman
- 4- Artificial Recharge of Flash Water and its Recovery by Mr. Nauman Rashid, Expert, Schulmberger Water Services – UAE



The third session on Floods and Risk Management started on the Second day of the workshop (Tuesday 5 September 2006) at 08:00 am.

The following papers were presented during this session:

- 1- A Historical, Creative and Sustainable Scheme for Protection Against Flash Flood by Mr. Kamran Emami, Director General , Kurit Kara Consulting Engineers – Iran
- 2- Methods for Flood Risk Assessment: Concepts and Challenges by Ms. Annegret H. Tieken, Berlin University, Germany
- 3- Risk Management of Flash Floods in Tehran by Mr. Kamran Emami, Kurit Kara Consulting Engineers – Iran
- 4- Gash River Flash Floods Challenges to Kassala Town: Mitigation and Risk by Mr. K.E. Bashar, Associate Prof., UNESCO Chair in Water Resources – Sudan



During the fourth and fifth session on flood management and mitigation (case studies) several papers were presented as follows:

- 1- Flood Mitigation Reservoirs Possible Solution for Flood Prevention A Case Study of the Proposed Salalah Dam Project by Mr. Zaher Al Suleimani, Director General, MRMEWR, Sultanate of Oman
- 2- Flood Problems in the City of Dhaka and Possible Mitigatory Measures, by Mr. Tauhidul Anwar Khan, Member of joint rivers commission, Bangladesh
- 3- Urban Flash Flood Protection in the City of Mashhad by Dr. Saeed Nairizi, Director General, Toosab Consulting Engineers – Iran
- 4- Issues and Problems with Flash Flood Modeling in the Capital Region of Sultanate of Oman by Mr. Ghazi Al-Rawas, Prof. University of Calgary, Canada
- 5- Flood Control Project in Salalah, Oman by Mr. Ahmed Majid Al-Hakmani, Technical Advisor, Dholfar Municipality, Sultanate of Oman



- 6- Urban Flooding – A Case Study of Mumbai, by Mr. H J Shiva Prasad, Associate Prof. University of Agriculture and Technology, India
- 7- Dez and Karun Flood Mitigation Plan, by Ms. Elham Eftekhar Javadi, Senior Expert, Mahab Ghodss Consulting Engineers – Iran
- 8- Flash Flood Variability and Protection of Maan City, Southern Jordan, Cases from an Arid Area by Mr. Mohammad R. Al-Momani, Expert – Ministry of Water and Irrigation – Jordan
- 9- Dam Failures due to Flash Flood and its Review for Mirani Dam Project by Mr. Zahed Majeed, Deputy Director, WAPDA, Pakistan
- 10- The Impact of Urbanization on the Wadi Channels in Muscat, by Mr. Al-Farsi, MRMEWR, Sultanate of Oman
- 11- Storm water Management and Road Tunnel (SMART) An Underground Approach to Mitigating Flash Floods, by Mr. Datuk Ir Hj. Keizrul Abdullah, Malaysian National Committee on Irrigation and Drainage, Malaysia



Finally the General report was presented by Mr. Unal Sorman from Turkey and the recommendations have been attached to this report.

The closing statements were presented by Mr. Tejada-Guibert as UNESCO's representative, Mr. Zaher Solaimani as the General Director of Water Resources Affairs in MRMEWR and Dr. Ardakanian as the Director of RCUWM – Tehran.



Certifications were also granted to all the authors and co-authors which were delivered to them at the end of the workshop.



As a side event an exhibition was held for the Iranian and Omani organizers to demonstrate their activities, achievements and projects.



On the third day of the workshop a technical tour was arranged for all the participants to visit the hydraulic structures outside Muscat which was highly received by the visitors.



Finally back to back to the international workshop, the 3rd Executive Committee of RCUWM – Tehran with the objective of following the items approved during the 4th Governing Board Meeting of the Centre as well as the Donors Conference preparatory meeting with the goal of planning and defining the workplan for holding RCUWM Donors Conference in the year 2007 was held on the 6th of September 2006.



Concluding remarks

Floods are natural unavoidable events, this are all should accept and develop the concept of “Living with Floods”.

Floods are physically complex processes and responses are not clear. They look simple only at first glance; with intensive studies one may discover more and more the complexity of floods in terms not only of geophysical phenomena, but also of the origins, impacts to environment and management.

The establishment of flood (multi- hazards) warning centres may create a significant contribution to prevent the impact of water hazards across the country. The aims of the centre must be in line with UNESCO's objectives and programmes. In order to attain the goods, the best practical strategies must be delivered to local communities (Municipalities) they must appropriate to their specific local conditions (like wadi hydrology)

- Flood disaster usually happen:

When levels of flood are under estimated compared to the flood water volume

- a. because it is greater than expected or
 - b. because of incomplete understating of local conditions and events
- The factors affecting the flood levels fluctuations
 - a. The amount, type and intensity of rainfall
 - b. The nature and condition of the drainage area
 - c. Climate and Climate change (global warning)
 - d. Man-made influences on river (wadi) flows at the larger scale
 - e. Short abbreviations with unreliable date records.

WADI FLOODS

Wadi floods play an important role in arid land hydrology to ground water recharge which is the only renewable water sources.

Numerous studies in arid land on TRANSMISSION LOSSES have concluded that 40 – 50% of flood volume is lost in the wadi bed. Almost the other half of rain evaporates before it becomes effective rain.

- a. Surface hydrology
- b. Unsaturated (two-phase flow)
- c. Isotope hydrology
- d. Methods to be used and modelling in surface, subsurface flow processes

Integrated Flood Management

Structural and non-structural flood measures are important for flood management

Non- structural measures are:

- a. Social management, land use planning
- b. Monitoring networks for rain/runoff
- c. Early warning
- d. Forecasting systems, integrated wadi management

Flood forecasting

No model is best (suitable) for all drainage systems.

Nowadays, in many countries, flood warning forecasting has evolved into a network of sophisticated forecasting systems. Such as



- a. focusing on engaged basins
- b. focusing on extreme floods in recent years
- c. focusing on uncertainly (reliability of estimates.)
- d. integrating flood hazards with risk assessment and vulnerability

Lumped Modelling approach may assist the site-specific calibration and need time updating to provide appropriate forecasts.

- But for extreme storm conditions and for engages basins the service fully destructed rainfall- rain off models are more superior with the integration of RS/GIS technologies)

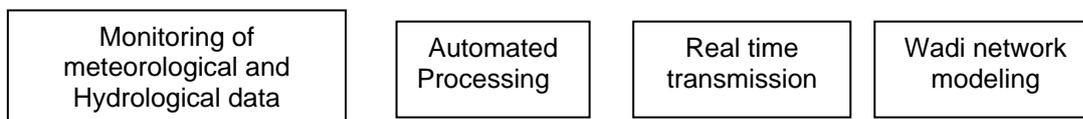
The use of distributes models for need – tune flood forecasting

Uncertainty estimation using more accurate and reliable data to produce the flood magnitudes and volumes (spacial/temporal), integrating with input element



FURTHER COMMENTS AND RECOMMENDATIONS

1 a



1 b Conduct a flash flood feasibility study focusing on objectives, feasibilities, limitations, benefits of flash floods structural/ non structural systems

2 Application of new technologies (RS/GIS – MIS)

3 Integration of atmospheric circulation with falsh flood forecasting (calibration/testing) models.

4 For flood control and artifical exchange. Build and operate dams/reserviors at appropriate wadi location (water use and control)

5 Use physically based (atmospheric land surface + groundwater models) including the most possible process elemetns to estimate quantity/quality of surface water and groundwater.

6 Determine wadi hydrology parameters in Arid climate including (topography, morphology, land cover, climatic etc) for representative wadis.

7 Select pilot basin using similarity, response unit antenia for mather instrumentation.

8 Apply Regional friquency analyses (RFA) methods rather than at site data (use L-moments Pum procedures analysis.)

9 Participate actively in local/national and internternational activities and training programme. Establish diologs with WHO, UNESCO, G-NET and other organisations related to floods.

10 Set up electronically operated loggers, sensors and record in small time increament in order to represent temporal /spatial variability for rainfall, wadi flows, groundwater wells, including aflaj and springs. Even if possible setup Radar and transfer the data on telemetric ways (GPRS,GMS and/or satellite) to the early warning centers (upgrading the hydrometric network).

11 Training of technical staff for monitoring preprocessing of data for inserting on near real tune to avaporational models.

12 For decision support system

a. one should check the data quality to make it sure they are reliable (recalculatory the slope - area survey or current meter measurements) Be sure rating curve is representing the cross - section for dialy/hourly flow rates (Area, roughness) + (well trained field stuff).

b. Use suitable models for their comparison (peaks, volumes, time to peak)

c. Historical storm events will truly be studied, flood mapping on DTM will be marked to check the calibrated 1D or 2D models (steady/unsteady)

- 13 For early warning system
- a. Long term statistical records should be kept for real time monitoring and evaluation comparison
 - b. Preventive methods will be checked on the sites
 - c. Coordination among government organizations such as
 - i. Ministry of Transport and Communication (Civil aviation and meteorology department)
 - ii. Ministry of Regional Municipalities, Environment, and Water Resources.
 - d. Action plans as notification, evacuation, announcement by Radio, mobile phones, etc

As a result of all these actions, water will be controlled to minimize the hazards, maximize the use, to save lives, property and infrastructures.

